

## AFSPC A5CS SSA Activities

**Hans Thatcher, Lieutenant Colonel, USAF**  
*Air Force Space Command*

With the signing of the National Space Policy in Jun of 2010 and the National Security Space Strategy in January of this year, the Department of Defense and the Air Force have clear direction to preserve vital national security capabilities in space. The ever-growing population of resident space objects necessitates improved Space Situational Awareness (SSA) to ensure safety of flight and enable defensive actions when necessary. The Air Force, through Air Force Space Command, has placed a particular emphasis on increasing National SSA capabilities in the Deep Space environment by fielding technologically advanced systems, seeking partnership opportunities, and identifying areas where data exploitation and technology advancements are needed.

### SPACE IN DAILY LIVING

Whether the average person realizes it or not, space is integral in our daily life. The global economy has become dependent upon the capabilities space systems provide; the ability to conduct financial transactions, monitor terrestrial weather, provide safe air travel, and communicate around the globe all have become reliant on space-based capabilities for successful and safe execution and completion. Our lives are impacted daily by the effects of space capabilities

### TODAY'S WARFIGHTER DEPENDS ON SPACE AND CYBERSPACE

In addition to our daily dependency on space, military operations have become extremely reliant upon space capabilities and their effects. The most obvious dependencies are Precision Navigation and Timing (PNT) effects, the same effect that enables on-demand financial transactions and point-to-point personal communications in our civilian lives. Joint Commanders rely on PNT for Blue-Force or Friendly Force Battlespace Awareness and more importantly precision strike, which has fundamentally changed the way we conduct war. We also have relied on and continue to rely on space capabilities to provide us with communications, intelligence, weather and missile warning and defense. It is more crucial than ever that we have situational awareness of the objects in space and the events affecting the capabilities today's warfighter has become dependent upon.

### SPACE ENVIRONMENT IS CHANGING

Space is becoming increasingly more competitive, congested and contested. Since 1990, the number of space faring nations has more than doubled; creating an environment where more nations are active in space and increasingly reliant on those capabilities. The number of known objects has also increased over the last 40 years, creating concerns over the associated congestion in desired orbit regimes. There are a few factors contributing to the increase, the most obvious being the actual number of objects being put into orbit, the next being the increases in SSA capability, such as the Sheymya radar operating at full power. It is likely as we field more capable sensors, we will see an increase in the number of observable objects. The remaining contributors are events that led to an overall increase in catalog objects, the latest being the Iridium-Cosmos collision. With the increase of space faring nations, the space environment is also becoming increasingly more contested. Nations are demonstrating the capability and intent to counter the space advantage the U.S. warfighter currently possesses. Today's adversary relies mainly on non-kinetic or reversible effects, with kinetic capabilities being demonstrated and fielded in the not-so-distant future. As these counter-space capabilities migrate toward space-based platforms, the need to understand them and act to counter these effects becomes more critical. The SSA network must evolve to provide the sensitivity and timeliness required to provide the joint warfighter the information to understand the threat, counter the threat, and operate in a contested space environment.

### NATIONAL SPACE POLICY, JUNE 2010

The June 2010 National Space Policy reiterated the commitment of the United States to execute the SSA mission; specifically "Develop, Maintain, and use space situational awareness (SSA) information from commercial, civil, and national security sources to detect, identify, and attribute actions in space that are contrary to responsible use and the long-term sustainability of the space environment". It also redefined the roles Secretary of Defense and the Director of National Intelligence: "Maintain and integrate space surveillance, intelligence, and other information to develop

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accurate and timely SSA. SSA information shall be used to support national and homeland security, civil space agencies, particularly human space flight activities, and commercial and foreign space operations” The National Space Policy also gave the specified task “The Secretary of Defense shall be responsible, with support from the Director of National Intelligence, for the development, acquisition, operation, maintenance, and modernization of SSA capabilities”. In addition to renewing the U.S. commitment to the responsible use and long-term sustainability of the space environment, it directs the two primary users of space, the Department of Defense and the Intelligence Community, to cooperate and collaborate together and with other stakeholders to make more effective use of their respective capabilities to meet current and future SSA needs; as well as support each other in the sustainment, acquisition, operations, and modernization of our current and future capabilities.

### **SSA AND C2 REQUIREMENTS OVERVIEW**

The SSA mission threads are derived from requirements stated in the USSTRATCOM Space Situational Awareness Initial Capabilities Document going through Joint Staff coordination, as of 1 Sep 2011. No single SSA sensor can meet mission thread requirements alone; SSA is a team sport with each sensor using its attributes to bring a piece of the picture to the table. Foundational Operations, or Foundational SSA, are the routine functions that we use to maintain the baseline catalog, be it catalog maintenance, status of friendly forces, or collecting information to be further analyzed by intelligence specialists to assess objects of interest. Sensors are key to monitoring launch events and detecting on-orbit events, such as a breakup or maneuvers. Foundational SSA and Event monitoring provide information to Joint Space Operations Center personnel for Conjunction Assessment and, if needed, for Collision Avoidance notification/operations. SSA sensors are also critical to determining Anti-Satellite threats, direct or co-orbital, and dealing with the maneuver/breakup/separation events resulting from such activities.

### **WHAT IS SPACE SITUATIONAL AWARENESS**

SSA is knowledge of all aspects of space, in order to achieve this we require Friendly Force Status; not just status of the space asset itself, but of the ground station equipment, capability degrades, current tasking, and status of those forces operating the systems. This is not limited to the status of SSA sensors, we also take into account the status of a system of interest, for example GPS, to help provide the complete picture of our friendly force status. There is information out there that the SSA sensor is not going to capture. Intelligence on adversary space activities reveals information on their capabilities and more importantly the adversary’s intent. Through various sources, we can put together a more complete picture of an adversary’s intent, especially if an event is predicted or detected.

Surveillance of all space objects and space activities is where the Space Surveillance Network contributes the majority of the data. It basically gives us verification that a friendly maneuver went as planned, verifies an adversary event executed as predicted, or tips us off that an adversary event requires additional assessment. Detailed reconnaissance gives us the visual assessment as to an object’s capabilities and helps us characterize the true intent of that object of interest. It can also provide some assessment of friendly capabilities, especially during early checkout; examples being the deployment of solar panels or proper orientation. SSA also includes the monitoring of the space environment, to help be predictive of solar events which might degrade our ability to deliver reliable communications or navigation signals. The most important piece of this puzzle is the integration and fusion of the data to provide a more complete picture of our space situation, and getting that data to users and decision makers to assess any adverse effects respective to their battlespace.

### **CURRENT SPACE SURVEILLANCE NETWORK**

The current Space Surveillance Network is a collection of ground and space-based optical platforms, focusing on the deep-space need, and ground based radar providing for the low-earth requirements. Imaging radars provide for the detailed characterization of objects of interest. These sensors are a mixture of SSA dedicated sensors, collateral sensors, which have another USSTRATCOM primary mission and SSA as a secondary, and contributing sensors, which have a non-USSTRATCOM primary mission (typically R&D or Intelligence collection) and are leveraged for SSA, as needed or as available. SSA is a team sport and requires the attributes of the entire network to meet the warfighter need.

### **SSA SYSTEM DEVELOPMENT**

The number of objects in space is increasing and the size of objects of interest is decreasing. If we are going to meet the future need, we must continue to modernize and evolve the SSN. Programs on the horizon are the Space Fence, which will provide more responsive coverage to find smaller objects in the low-earth regimes, fix, and track them. The DARPA Space Surveillance Telescope (SST) will provide the same capability for the deep space regime. Space-Based Space Surveillance (SBSS) satellite will provide the timely revisit of objects of interest and reduce the

adversary battlespace by shrinking the solar exclusion zones ground-based telescopes currently have to operate around. Enhancing our space environmental monitoring capability will enable us to become more predictive of space weather events and also facilitate attribution of solar effects on operations. These efforts provide the joint warfighter actionable knowledge to leverage American and allied space capabilities, protect our space assets, and counter those systems used for hostile purposes.

### **SPACE FENCE CRITICAL CAPABILITIES**

The Space Fence is needed to keep up with future catalog growth and the smaller objects, which will present a threat to objects operating in the low-earth regime. It is predicted to be a workhorse in the discovery of new objects, once discovered; enabling the network to track those objects. It will provide coverage for low-inclination objects, the southern hemisphere, and high interest foreign launch corridors. It will increase the completeness of the catalog, by providing low-inclination coverage, and provide for increase accuracy of objects where perigee occurs in the southern hemisphere. A dispersed two site configuration will provide the additional coverage needed to improve event detection timeliness.

### **SPACE SURVEILLANCE TELESCOPE**

We are looking forward to the data produced from SST. As a DARPA demonstration, it is the first technology push for deep space surveillance in 30 years, curved CCD mosaic camera and a 3.5 meter Field of View. We anticipate it to provide rapid wide-area search and to find, fix, track and provide greater characterization of faint objects, which exceed the current fleet of dedicated telescopes.

### **SPACE-BASED SPACE SURVEILLANCE BLOCK 10**

This system was launched in Sept 2010, and since then has undergone test and checkout. It is currently contributing to the decrease in the average element set age, reducing it from 1.5 days to about 9 hours. In the past year, it has demonstrated the utility of an on-orbit asset. It is also key in providing timely access to objects, which ground-based telescopes cannot match (being affected by daylight or weather). This timely access also enables us to revisit event capable objects, thus arming the joint warfighter with the most current information on that object, in order to provide actionable information.

### **SUMMARY**

SSA is a team effort, and we must continue to evolve the network to meet current and future needs, and make that information available to current and future partners, including commercial and foreign entities. As more entities, foreign, domestic, and commercial, make more use of an already dwindling resource; it is imperative that all of us strive to be good stewards of that limited resource. We must become increasingly vigilant, in order to do so, we must continue to evolve our capabilities to understand how this resource is being managed and establish the infrastructure, partnerships and policy to protect it.